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AUTHOR Vollmer, Natalie
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ABSTRACT

This paper considers different forms of classroom interaction, focusing particularly on cooperation, the different forms of cooperation, and the functionality of these forms with regard to learning opportunities. The form of student cooperation evaluated is defined as help. The research context is Gotz Krummheuer's project on the reconstruction of formats of collective argumentation in primary mathematics classrooms. The current work widens and complements Krummheuer's perspective by asking in what kind of cooperative situations one can expect processes of arguing. Data were derived from a project in Berlin, Germany. All classroom activities of a first-grade class were videotaped over a 2-week period in which field notes were taken and students' papers were collected. Three interactions were selected for analysis to show where student help becomes obstructive. Results illustrate aspects of help that can function in an obstructive way. For example, one partner may utter a wish for help which can function as a distraction. Further, one partner may help without being asked which can function as a nuisance. Contrastive analyses of less fruitful processes of helping along with describing arguing processes might help in developing the empirical basis for a grounded theory on the social conditions of learning in classrooms. Contains 13 references. (PVD)

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Helping in Mathematics Group Work: Supporting and Disturbing Cooperation

by
Natalie Vollmer

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Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, Illinois, 1997

Natalie VOLLMER Free University of Berlin, Germany

Helping in Mathematics Group Work: Supporting and Disturbing Cooperation

In the frame of the symposium:
Social Conditions of Mathematics Learning: Arguing in Classroom Interaction

I. Introduction

My perspective on the social conditions of mathematics learning goes beyond the investigation of arguing in classroom interaction. In my opinion, it is important to consider also the different forms of interaction, because learning is situated in, and determined by these interactive contexts. The analysis of cooperation and of different forms of cooperation, and the functionality of these forms in respect of learning opportunities are my focus. The initial question is: How do forms of cooperation support or disturb opportunities for learning? For this talk/paper, the cooperation form of help is moved into the center.

The research context of my work is Götz KRUMMHEUER's present project about the reconstruction of formats of collective argumentation in primary mathematics classrooms. This project is sponsored by the German Research Foundation (Deutsche Forschungsgesellschaft, DFG). In the frame of this symposium, KRUMMHEUER concentrates on reflexive arguing and on the narrative character of arguing in elementary school classes (see also KRUMMHEUER 1997). He primarily asks the question: how does students' cooperation function in respect of argumentative processes, or in other words: how does arguing take place in group work? I am going to widen and complement his perspective by asking in what kind of cooperative situations one can expect processes of arguing, actually.

State of affairs, state of research

In connection with learning in school, students' cooperation and the learning opportunities it can provide are frequently discussed. Many works are occupied with the question, how to ameliorate cooperation situations. Some concentrate on learning material (see e. g. Rijkje DEKKER 1995, Netherlands, or Martina RÖHR 1995, Germany), others on the teacher's possibilities (see e. g. Terry WOOD). Questions are asked like: How can a teacher support student cooperation? How can she or he enable the students to work together fruitfully? Or: How can one try to get a suitable classroom culture established?

In contrast to that, hardly any attention is paid to the fact that cooperation can disturb and obstruct learning. In order to understand more about the course of events in classroom interaction and cooperation, it is important to consider the dysfunctional aspects, as well. Additionally, it is important because in many classrooms, cooperation is encouraged without taking problematic impacts on the learning process into account.

The notions of *cooperation* and *help*

Here, *cooperation* is used in a wide sense, to be precise: it refers to students' interaction in working processes. It is used as a generic notion for any form of work which includes events of interaction, even for situations where students mainly work next to each other. Thus, *cooperation* does not only stand for (supposed) "ideal" situations.

Forms of cooperation are for example:

- working next to each other
  (similar to what GOOS/GALBRAITH/RENSHAW (1996) call "parallel activity")
- helping and receiving help
- whispering or telling something to someone
- explaining something to someone or teaching someone
  (similar to what GOOS/GALBRAITH/RENSHAW (1996) call "peer tutoring")
- common problem solving
  (GOOS/GALBRAITH/RENSHAW (1996) call this "collaboration")
- division of labor
  (VOLLMER/KRUMMHEUER (1997) show how processes of dividing labor interdepend with the development of mathematical understanding of the task according to ERICKSON's (1982) academic task structure ATS and social participation structure SPS).

These examples are not to be understood as a complete system of disjunctive categories but rather as means for openly describing cooperation.

Help is one frequent form of cooperation among students. It bears the connotation of being a supportive means in respect of learning.[1] But on the other hand, help can hinder, as well, that is to say, it can have negative impacts on the opportunity of learning. Thus, the notion of *cooperation* needs an empirically grounded differentiation. From this perspective, here, rather obstructive processes of cooperation will be investigated exemplarily. Thereby, the exemplaricity is twofold: firstly, help is seen as an example of cooperation, secondly, the analysis is grounded only on a small part of empirical data.

Plase note, that in the context of this work, *help* is not primarily defined by "usefullness". Instead, it refers to situations which are or could be called so by the participants or researchers.

II. Theoretical framework

For this work, constructivism and interactionism as outlined for example by COBB & BAUERSFELD (1995) build the main part of the theoretical framework.

In constructivism, knowledge - or more precisely: knowing - is seen as an ascription of meaning, as an interpretation of experiences. The individual constructs its knowing actively. Knowlegde in the sense of reflecting a so-called

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[1] In more detail, it is even held that students can help other students better than teachers or adults can, because they are closer to the (cognitive) problems of their peers. Additionally, there is the approach that the one who helps makes at least as much profit of it as the one who receives the support.

reality does not exist. BAUERSFELD calls this idea an "illusion" (COBB & BAUERSFELD, Eds., 1995). - I do not not doubt a reality, but certainly, we will never grasp it completely.

Knowlegde must be viable. If it looses its equilibrium because of any experienced disturbances, a cognitive reconstruction is possible to follow. In Piaget's terms, the individual experiences a perturbation and accommodates its cognitive scheme (see VON GLASERSFELD 1995). The disturbance of the cognitive equilibrium is often regarded as an indispensible but not necessarily sufficient condition for learning processes. So, a perturbation of a cognitive equilibrium presents a potential learning occasion.

Such disturbances and perturbations most frequently become obvious in the frame of interaction. From that point of view, cognitive constructions usually get developed in social situations, in interactions. In the context of school and classes, this is evident. Many teachers stand up for cooperative forms of learning because in those, the students are more engaged in interaction.

But in the frame of interactionism, the theoretical importance of interaction goes beyond the aspect of perturbations; actually: it takes effect earlier. The individual makes its interpretations of reality mainly in interactive settings or through experiences made in interaction. In these interactions, meanings become commonly negotiated and stabilized; the partners reconcile their interpretations to each other (KRUMMHEUER 1992 calls this the convergence function of social interaction, p. 44). So, knowledge is not only an individual matter but also a social one. Here, the necessity of connecting the individualistic with the collectivistic approach becomes obvious.

Also Terry WOOD (1996) stresses the high importance of interaction for cooperative learning processes. She does not only focus on perturbations but at least as much on the fact that the social dimension is constitutive for the individual construction of meanings, altogether (see also KRUMMHEUER 1997). In the discussion of one of her empirical investigations concerning cooperation in mathematics classes, she writes about the learning process of a student called John:

> "The event for John in which learning occurred was not initiated by a conflict in his existing scheme, but was motivated by his goal to participate successfully in the classroom discussion." (p. 103)

This is strongly tied to another concept of interactionism: to the concept of *culture*. BRUNER (1986, 1990) reinforced it in the educational discussion and it is taken up for example by KRUMMHEUER (1997). Aside its culture's language, the child learns culture specific ways of explanations (BRUNER 1990, p. 33-35). Life is only understandable "by virtue of those cultural systems of interpretation" (BRUNER 1990, p. 33).

Learning implies a process of socialization and acculturation, that is to say: to develop into a (sub-)culture, to aquire certain ways of behavior, to integrate into and to get integrated into a group. That is the way the notion of *culture* can be applied to classrooms: one can see a specific culture in each of them and also in the different school subjects.

Based on this theoretical background, learning is understood as happening mainly in social interaction while the partners are commonly emerging meanings whose cognitive representation is in the individual's mind.[2] The fact that the shared meanings are not identical with the individuals' representations can cause disturbances in the course of interaction, respectively of cooperation.

The approach to the following analyses of empirical classroom interaction data is microsociological.

III. Data resource and method

The data derive from the project in Berlin mentioned above. The method is microethnographic and bound to interpretative classroom research. During a period of two weeks all classroom activities of one class were videotaped. In addition, field notes were taken and students' papers were collected. Then, interactions were selected for transcription. This selection is based on review of the field notes and on watching the videotapes as well as being guided by the purposes of the study. Subsequently, certain episodes are being interpreted in several steps. Following the logic of abductive research, one finally tries to generate some "substantive theory" (see e. g. GLASER & STRAUSS 1967).

The actual class is a first grade. The students sit in groups of six, three tables building a big one. Every week, the students get a list of tasks which they are responsible to fulfil. Working on their tasks, usually some of the students talk to each other. So, the lessons are held in a rather "open", non-teacher-centered way. In the frame of the so-called "weekly work", situations of cooperation are the center of my interest; more precisely: situations of hinderly cooperation.

IV. Analysis of classroom reality

The analysis of three examples shall show and differentiate situations where help becomes obstructive. The interpretation of the first example is founded on a summary of its situation, while the interpretation of the second and third episode are based on transcripts.

The first and the second episode have the same actors: Fredi, who is a German girl, and Yasser, who is a boy of a Turkish family living in Berlin.

IV.1 First Example: Asking for help, and helping

Help can block learning paths for the helper and for the one who receives help. A student can feel interrupted or distracted by someone elses wish for help. Then, he or she may help very pragmatically in the way which allows him or her to get off the role of the helper most easily and quickly. The other must be able to finish off his/her work, but the helper does not necessarily care of learning processes or anything the like.

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[2] Thus, the concept of learning can be related to that of cooperation in at least the following two ways: firstly, *perturbations* in the Piagetian sense can work as occasions to learn, and secondly, the student wants to participate in the interaction, what can function as a "reason to learn" as well. So, cooperation can be fruitful because it provides perturbations, and because it forces to talk about thoughts.

Fredi and Yasser are working on their weekly tasks. They do so at the same group table, Yasser sitting at one length of a table corner, Fredi standing around that corner at Yasser's right side.

Yasser is occupied with substractions in the range up to ten. The working sheet is a black on white picture of a bird. It is arranged in different fields. Each field contains a task. On the bottom of the sheet there is a legend with possible solution numbers on the left and written colors on the right side. The students are supposed to encode the number of their solution into a color and to color the corresponding field of the picture. - Please note, that in German, reading instruction does not follow spelling rules but is mainly based on the relation between letter and sound (grapheme and phoneme).

Yasser gets the mathematical solution, but can not read the word *yellow*. He curses and asks: "What does this say?" He tries to read, that is to say, he tries to make a sound for the first letter, but the sound he makes is not suitable for any color word. Then he asks: "Do you know what six is?" Without calling it so, he asks for help.

Fredi does not answer but works at her sheet. It seems as if she feels disturbed but does not let herself get interrupted. Yasser waits, drums his fingers on the table and watches her. After a while she looks at him. She does not respond before it suits her, namely, not until it fits into her working process. Fredi seems to know how to handle this somehow disturbing and distracting situation.

Yasser smiles, asks her to look, and tells her that he has forgotten the *letter*. So, he names his problem very precisely. But Fredi gives quite a complete answer: "Yellow."

Though Yasser is very content, this seems to be an obstructive form of help. Fredi blocks Yasser's chance to read the word himself. He only needed the first letter. With that, he could have had a try and could have been successful, but Fredi gives him the whole word. Now, he can finish his task, but what did he learn? Can he read the word, next time? Does he know how the letter sounds?

IV.2 Second example: Defending oneself against help

Help can disturb so much, that a student defends himself against it. Founded on the wide definition of help, made above, also this episode is going to be discussed as an example for help.

IV.2.1 Transcript: "I wanna calculate myself"

1	Yasser	don't tell\ . no I wanna **calculate myself** *(quickly covering his*
2		*file)*
3	Fredi	I'll tell you
4	Yasser	**no** it's far better you **don't** *(looks at her)*
5	< Fredi	*((< = talking at the same time))* *(closes her pen)*
6		five minus one that's so easy\
7	< Yasser	*((< = talking at the same time))*
8		no no **no**
9	Fredi	well that's

10 Yasser *(quickly in a row)* don't tell don't tell don't tell .. *(looks at his*
11 *fingers)* **four**\

12 Fredi yeah-

13 Yasser *(not understandable) (makes a pleased gesture towards Fredi)*

IV.2.2 Interpretation

Yasser makes clear that he does not want any help, that he wants to do it himself. He strictly asks Fredi not to tell him (and the interpreter supplements:) the solution. It is notable that he feels disturbed. Then, he elaborates on that, and explains that it would be *better* if she did not tell - but *better* in respect of what? Certainly, in respect of what Yasser wants at that moment. Also, we know, that it is better for the learning process. It is also conceivable, that his utterence contains a sort of rule, maybe even a rule which was mentioned by the teacher some time before: you shall not whisper someone something.

Fredi is teasing Yasser. It can be questioned whether her behavior can still be called help. Yasser does not seem to appreciate it as help. Maybe, it is more sort of a provocation and a struggle, perhaps a playful struggle. (Of course, in other contexts, it is imaginable, that this kind of forcing help on someone can present a possibility to get in touch or into interaction with someone.)

IV.3 Third example: Arguing about help

The way of helping can move into the center and get treated as a subject on its own. - In the third example, one student tells another how to help, before the teacher joins the group and explains the general aim of helping each other. Though nobody uses the notion *help*, the situation is defined as a helping situation, because shortly before, the teacher has asked, who was going to help whom. (Woil, Jasmin, and Grigori are all boys' names.)

IV.3.1 Transcript: "tell him how to do it"

1 Woil *(goes to Grigori and Jasmin; Jasmin is helping Grigori)*
2 uh/ one is not allowed to copy like this\

3 Jasmin of course you may\

4 Woil no\ you are only to tell him how to do it\

5 Jasmin uhm/ *(not understandable)* hey I **know** how to do it\

6 Teacher well Jasmin\ it's like that\ . well . Grigori does **not**
7 understand it when he **copies**\ but Grigori **does** understand it
8 and can do it on his **own**/ . when you tell him **how** to do it\
9 do you understand Jasmin\ when you tell **how to do it**\ then
10 he can do it on his own then he doesn't need to copy
11 anymore\

12 Jasmin yeah -

13 Teacher all right/ well try it . **how** one does it\ . *(not understandable)*
14 you'll manage\

IV.3.2 Interpretation

Jasmin is helping Grigori. Woil joins them and says - seemingly to Grigori - that he is not allowed to copy like he is doing. Jasmin contradicts that, of course, Grigori may copy. He seems to have no doubt about it. Then, Woil starts to elaborate, that Jasmin should tell Grigori only to *how* to do it. Taken together, Woil expresses, that Jasmin has not to give the solution itself to Grigori, but to explain the way of solving the problem in order to enable Grigori to get it himself. This almost resembles a general rule about help and helping.

Jasmin responds that he knows how to do it. Thereby, it does not become very clear whether he refers to the mathematical task or to the more social task of helping.

However, then, the teacher joins the group and explains to Jasmin some rules. It is like a summary and a continuation of what Woil said before. The teacher stresses the importance of enabling someone to understand things and to do them solely. Only in this case, the other does not need to copy any longer.

V. Results

Classroom interaction has several forms. One can divide it in respect of the participants into student-student interaction and teacher-student interaction. At the same time, for example, interaction which is linked to working processes can be distinguished and understood as cooperation. Different forms of interaction present different social conditions of, and opportunities for (mathematical) learning.

In this talk/paper, I focussed on one form of student cooperation: on *help*. In contrast to the widespread idea, that help is fruitful, supportive, and potentially productive, per se, I illustrated some aspects of help, which can function in an *obstructive* way:

- one partner utters a wish for help
- one partner helps comprehensively
- one partner helps without being asked for.

Aside from and across asking for help and helping each other, students also *talk about* help. So, additionally to the three obstructive forms of help and next to supportive forms which I do not deal with in this talk/paper, there is another way it occurs in student cooperation:

- to talk about help.

These aspects and their functioning shall be discussed in more detail:

- A student can disturb or interrupt another in his or her working process by asking for help. This goes back to the fact that everyone thinks and works in a different way and speed. This is only natural. To think that interaction could go undisturbed is an illusion anyway.

  In the example of Fredi and Yasser and the unreadable color name, Fredi did not let herself get interrupted. Only when it suited her, did she respond to Yasser.

- A student can block a fellow's learning process by "over-helping", that is to say, by giving him or her a complete answer or solution (instead of a little hint) in

order to get off the role of the helper as soon as possible. This sort of help is not oriented by the long run but by the very situation. The other shall only become enabled to fulfil his or her task. Whether he or she learns to do it autonomously in the future, is not in the center of the helper's interest. One can call this "pragmatical help". It is oriented by performance rather than by learning (see GOOS/GALBRAITH/RENSHAW 1996). As a matter of course this way of helping may take longer than some sort of help which only aims at a quick relieve. In this connection, one has to take into consideration, that interaction is economically structured altogether.

In the example of Fredi and Yasser and the unreadable color name, Fredi tells Yasser more than he wants to know of her. He only needs the name of the first letter, but Fredi tells him the color he has to use to finish off this part of the task.

- A student can force help on another student though the other does not long for help - even despite his or her protest. This is consciously dealt with and an obvious obstacle for learning.

  The second episode with Fredi and Yasser is an illustration for this sort of help where nothing must be added to.

- A student can initiate a talk about help and get the other(s) to reflect about rules or something the like.

  The first of the two examples of talks about help is a situation in which a student tries to defend himself against help which he does not want. In the second example, a student tells another how to help before the teacher explains the general aim of helping each other.

In short:

• one partner utters a wish for help	→ can function as →	• distraction
• one partner helps comprehensively	→ can function as →	• obstacle to autonomous work
• one partner helps without being asked for	→ can function as →	• nuisance
• to talk about help	→ can function as →	• means to act, respectively to interact, more deliberately and constructively.

These first insights, allow a more differentiated view on the cooperation form of help and on its possible effects. Besides, the analyses illustrate the enormous complexity of classroom interaction and its importance in respect of learning opprtunities.

In the following remarks, I want to pick up the thread of the symposium's subject, which, in my opinion, stands next to the exposition so far.

In all forms of cooperation, one can search for students' arguing. In some, students possibly argue more and in a different way than in others. It is imaginable that an approach to the differentiation between help (or any other form of cooperation), which is fruitful or obstructive in respect of opportunities for learning, may be led by the question whether or how students argue. In the analysed episodes one can see the following connections:

- In the first example, Yasser utters a wish for help and Fredi helps him pragmatically. She only tells him something but she does not explain anything. None of both argues.
- In the second example, Yasser defends himself against Fredi's help. He supports his interest by stating it would be better if she did not tell him anything. But he does not give any further reason for this, and Fredi does not ask him for any.
- In the third example, Woil explains that the main thing is to show the other *how* to work on the task. But even in this episode, there is no reason-giving to be found. Only the teacher gives reasons and stresses the aim of helping someone.

Altogether, there is not a lot of problem-related arguing in these episodes, not even reflexive or narrative arguing (see KRUMMHEURER 1997). Thus, it becomes obvious that the development of the approach of discribing and differentiating forms of cooperation by looking for arguing processes needs to include contrastive analyses with examples also of less fruitful processes of helping. In the sense of a comparative analysis, both together might give us the empirical basis for a grounded theory of social conditions of learning in classrooms.

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Natalie Vollmer
Freie Universität Berlin, FB 12 WE 02
Habelschwerdter Allee 45
D - 14 195 Berlin

fon: Germany - 30 - 838 62 58
fax: Germany - 30 - 838 59 83
e-mail: vnatasch@zedat.fu-berlin.de